DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO
OPNAVINST 3000.12
OP-43
29 DEC 1987

OPNAV INSTRUCTION 3000.12

From: Chief Of Naval Operations

Subj: OPERATIONAL AVAILABILITY OF EQUIPMENTS AND WEAPONS SYSTEMS

Ref: (a) MIL-STD-721C, Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety (NOTAL)
(b) OPNAVINST 4441.12B, Retail Supply Support of the Naval Activities and Operating Forces (NOTAL)
(c) OPNAVINST 4423.5, Determination of initial requirements for secondary item spare and repair parts (NOTAL)
(d) OPNAVINST 4440.23, Procurement cycles and safety levels of supply for secondary items (NOTAL)
(e) OPNAVINST 4614.1F, Uniform Materiel Movement and Issue Priority System (UMMIPS) (NOTAL)
(f) SECNAVINST 3900.36A, Reliability and Maintainability (R&M) of Naval Material; policy for (NOTAL)
(g) OPNAVINST 4790.4B, Ships' Maintenance and Material Management (3M) Manual (NOTAL)
(h) OPNAVINST 4790.2D, Naval Aviation Maintenance Program (NOTAL)
(i) OPNAVINST 5000.49A, Integrated Logistic Support (ILS) in the Acquisition Process (NOTAL)

Encl: (1) Operational Availability Handbook

1. Purpose

a. To establish Operational Availability (Ao) as the primary measure of material readiness for Navy mission-essential systems, subsystems, and equipments installed in platforms (ships and aircraft).

b. To establish policy in the application of Ao thresholds, calculations, analyses and measurements.

c. To provide definitions and equations which program managers and developing agencies will use for calculating and reporting Ao to the Chief of Naval Operations (CNO).

d. To identify sources of data for use in Ao calculations and monitoring.

2. Cancellation. NAVMATINST 3000.2.

3. Scope. This instruction applies to all mission-essential equipments and weapon systems assigned to ships and aircraft. Non-expendable equipments and weapon systems include, but are not limited to, the following: Propulsion systems and associated equipment, sensors, weapon direction systems, guided missile weapon systems, gun weapon systems, underwater weapon systems, communications systems and associated peripheral equipments.

4. Concepts

a. Operational Availability (Ao) represents the expected percentage of time that a weapon system or individual equipment will be ready to perform satisfactorily in an operating environment when called for at any random point in time.

b. For purposes of calculating Ao, the quantitative parameters of reliability and maintainability per reference (a) are used as is supportability. Reliability is Mean Time Between Failure (MTBF), Maintainability is Mean Time to Repair (MTTR), and Supportability is measured by the total of expected response times required for logistic support and administrative or operational delays. Appropriate time values include Mean Logistic Delay Time (MLDT).

5. Discussion

a. The goal of CNO is to provide the weapon systems necessary for operating forces to accomplish their assigned missions within practical limitations and resource constraints. Although the performance capability of a weapon system is a key element, overall effectiveness is also critically dependent upon availability of the system. An Ao calculation, which reflects the overall relationship of the various factors contributing to material readiness, is the accepted means for assessing the availability of an equipment or a weapon system.

b. To preclude inconsistencies in Ao calculations, a standardized analytical approach is needed. Enclosure (1) provides definitions, methodology, and standard equations to be used for estimating, analyzing and measuring operational availability.

c. The results of Ao analyses must be compared to formal thresholds that have been established by CNO.

d. Ao calculations develop a basis for trade-offs among reliability, maintainability, and supportability considerations in order to exceed established thresholds. Such trade-offs apply both to alternative courses of action for purposes of achieving Ao

thresholds and to related cost considerations. Two principal uses of Ao analyses include the following:

(1) For systems and equipments under design or in various stages of development prior to operational use, Ao calculation techniques enable trade-off and sensitivity analyses for developing design specifications, entire support program requirements and budget justifications.

(2) For systems in operation, Ao analysis highlights problems which contribute to unsatisfactory availability and assists in developing plans for corrective action.

e. In order to perform trade-offs that will provide an acceptable operational availability, the relationship of the elements that contribute to availability must be established.

f. In general, the nature of Ao trade-offs is such that reliable, easily-maintained systems require lower levels of support than those which are less reliable and more difficult to maintain; however, for economic as well as practical considerations, reasonable limitations apply. For example: technological considerations and developmental costs constrain engineering design or redesign; maintainability limitations are imposed by training and experience of operators and maintenance technicians. Furthermore, references (b) through (e) constrain spare parts support at organizational, intermediate, and depot levels, and establish goals for material movement response times. Regardless of the particular circumstances however, all elements contributing to Ao are subject to trade-off analyses. Each element is a candidate for added emphasis, increased funding support, or both, if Ao thresholds are not being met (or not projected to be met). Reliability trade-offs must be consistent with the guidance established by reference (f).

g. Although this instruction provides the structure for Ao analyses, an inflexible process is not intended. Within the stated guidelines, complex issues and specific circumstances applicable to individual weapon systems must be resolved on a case-by-case basis by analysts responsible for calculating Ao. Moreover, it should be recognized that some inaccuracies and incompleteness will exist in the data or estimates upon which calculations are based. Accordingly, Ao calculations are expected to be an accurate representation rather than absolute indicators of availability. Despite this possible lack of precision, Ao analyses shall provide assessments of sufficient accuracy and consistency to establish a basis for relative comparisons of availability over a period of time.

6. Policy.

a. Ao is the Navy's primary measure of material readiness for weapon systems and equipments.

b. Ao thresholds (the minimum acceptable values of Ao) must be established for new, emerging systems at the decision point to develop and for operational systems and equipments that are the subject of intensive management review and improvement actions. An initial range of thresholds shall be made available for major new weapon systems not later than immediately following a Defense Acquisition Board (DAB) Milestone I decision to proceed with development. Target thresholds should be established at the Milestone II decision point. The designated Project Manager (PM) or Hardware Systems Commander (HSC), as applicable, is responsible for requesting the CNO sponsor to establish Ao goals and thresholds if not previously specified. Additionally, to assist the CNO sponsor in establishing thresholds, the PM or HSC is also responsible for preparing preliminary Ao analyses based upon experience with similar weapon systems.

c. The definitions, methods, and other criteria contained in enclosure (1) of this instruction will be used to estimate Ao, to conduct Ao analyses, and to measure Ao.

d. Operational systems and equipments subject to Ao analyses, but which are not contained in the Selected Equipment List of the Maintenance Data Systems (MDS), references (g) and (h), should be considered for recommendations to the CNO 3-M Policy Committee for inclusion in the Selected Equipment List.

e. Ao analyses shall be conducted concurrently with system design and development and will be the basis for adjustments to design specifications, to support requirements and to budgets.

(1) Each Integrated Logistic Support Plan (ILSP) developed to support the requirements of reference (i) will contain a section which describes the Ao threshold and analyses required to meet and later to measure the threshold. It will identify the activity assigned to perform the analyses, the method of analysis and calculation, resources required, and milestones. Ao projections will be made available for higher level reviews such as those conducted by the CNO Executive Board (CEB).

(2) When requesting Approval for Limited Production or Approval for Full Production, the requesting activity will identify the results of initial Ao analysis and changes resulting from testing. In the event that the projected Ao is less than the established Ao threshold, the request for production will delineate actions and costs required to achieve the Ao threshold.

(3) Readiness thresholds and subsequent measures of readiness of systems introduced to the fleet shall be based solely on material readiness, not on total operational effectiveness of the system. Plans to achieve readiness thresholds and reported readiness shall account for all reported downtime for the systems (as reported in the maintenance data collection system). At the platform level, readiness thresholds and reported readiness data

shall be based on a reliability block diagram, a matrix or other listing of essential subsystems installed in the platform, arranged such that the ability of the platform to perform various missions can be ascertained, given the status of all essential subsystems and equipments. Readiness tied to stockage decisions is the pursuit of Readiness Based Sparing (RBS) models for interim as well as follow on support. RBS models can show the effects of spares availability on system operational availability and must be considered for weapon systems in Acquisition Categories (ACATs) I through III.

f. Ao analyses will be used as the basis for developing fleet material readiness improvement programs (RIPs). If Ao thresholds are not being achieved, actions recommended in such improvement programs will be consistent with conclusions drawn from Ao trade-off and sensitivity analyses. Due regard will be given to all elements which contribute to Ao and to related cost considerations. The expected impact on Ao will be specified for each alternative course of action.

7. Action

a. Program Sponsors within the Office of the Chief of Naval Operations shall establish Ao thresholds and provide them to Program Managers.

b. Commander, Naval Air Systems Command; Commander, Naval Sea Systems Command; Commander, Space and Naval Warfare Systems Command; and CNO-designated Project Managers shall:

(1) Provide historical data on Ao actually achieved for similar systems and a preliminary Ao analysis to the CNO sponsor.

(2) Conduct and report results of Ao analyses to the CNO and initiate actions necessary to meet or to exceed Ao thresholds. Previously unbudgeted costs and extraordinary support requirements which are indicated by analyses to be needed in order to achieve the Ao threshold shall be addressed to the Program Sponsor via Logistics Requirements and Funding Plans (LRFP) per reference (i). Alternative courses of action with associated Ao expectations and cost considerations shall be included.

(3) Maintain up-to-date estimates of Ao achievement for both newly-introduced and in-service equipment and weapon systems, and conduct periodic Ao analyses throughout the life cycle.

(4) Issue implementing instructions regarding these Systems Command responsibilities within 9 months of this Instruction's implementation.

c. Commander, Naval Supply Systems Command. When requested by Systems Commanders and Project Managers, provide assistance in the development of supply support statistical data to be used in

Ao analyses and assist with subsequent means of maintaining life cycle availability through supply support.

8. Forms. DD1692-2, S/N 0102-LF-020-8021, and DD1692-5, S/N 0102-LF-020-8051, may be ordered from the Navy supply system per NAVSUP P2002.

C. R. WEBB
Deputy Chief of Naval
Operations (Logistics)
(Acting)

Distribution:

SNDL	E3	(Activities Under the Chief of Naval Research)
	FKA1A	(Air Systems Command)
	FKA1B	(Space and Naval Warfare Systems Command)
	FKA1C	(Facilities Engineering Command)
	FKA1F	(Supply Systems Command)
	FKA1G	(Sea Systems Command)
	FT1	(Chief of Naval Education and Training)

All Divisions of OPNAV

Copy to:

SNDL	A1	(Immediate Office of the Secretary)
	A6	(Headquarters U. S. Marine Corps)
	21A	(Fleet Commanders in Chief and Detachment)
	22A	(Fleet Commanders)
	24	(Type Commanders)
	26F3	(Operational Test and Evaluation Force)
	E7	(Activities Under the Command of the Auditor General of the Navy)
	FD	(Shore Activities Under the Command of COMNAVOCEANCOM as delegated by the CNO)
	FF5	(Safety Center)
	FF42	(Scol Postgraduate)
	FG1	(Telecommunications Command Headquarters)
	FKP	(Shore Activities Under COMNAVSEASYSCOM as delegated by the CNO)
	FKQ	(Shore Activities Under COMSPAWARSYSCOM as delegated by the CNO)
	FKR	(Shore Activities Under COMNAVAIRSYSCOM as delegated by the CNO)
	FL1	(Naval Data Automation Command) (35)

Stocked:
NAVPUBFORMCEN
5801 Tabor Avenue
Philadelphia, PA 19120-5094 (100 copies)